

manner as the above described fluid simulating systems, a fourth inlet tube **502** communicates the umbilical vessel bladder **501** with a fourth solenoid valve **503** mounted in the interface box **5**. A fourth inlet flow restrictor **506** is mounted in line with the fourth inlet flow tube **502** immediately downstream of the fourth solenoid valve **503**, whilst a fourth outlet flow restrictor **505** is mounted in line with an outlet flow tube **504** upstream of the muffler box **14**.

An analogue pulse rate input dial **20** on the operate input terminal **5** provides an input pulse rate which is converted into a control signal by the processor **8** to periodically open and close the third and fourth solenoid valves **403**, **503** at a cyclic rate corresponding to the pulse rate input by the operator via the pulse rate dial **20**. The cyclic opening and closing of the third and fourth solenoid valves **403**, **503** provides a cyclic inflation and deflation of the blood vessel simulating bladders **401**, **501** which, when felt by manual touch has the realistic feel of a regular pulse rate. The simulator pulse rate of the manikin **3** can accordingly be assessed by a trainee in the usual manner for a newborn, either by grasping the umbilicus stub **19** or with the placement of one or two fingers on the arm at the usual location of the brachial artery.

For a child or adult manikin, a blood vessel simulating bladder could be placed on either side of the neck so as to simulate a carotid artery, being another common blood vessel used for the taking of a pulse.

The present inventors have found that a pulse rate can be most realistically simulated where the control signal provides a constant solenoid valve **403**, **503** opening time, with the solenoid valve **403**, **503** closing time varying to account for variations in pulse rate. That is, for a slower pulse rate the solenoid valve **403**, **503** closing time will be increased whilst maintaining a constant solenoid valve opening time. A particularly suitable solenoid valve opening time is approximately 0.15 seconds. Whilst separate solenoid valves **403**, **503** are used to control the flow of fluid to the brachial and umbilical vessel bladders **401**, **501**, it is envisaged that a single solenoid valve might be utilised to control both circuits if so desired.

The third brachial blood vessel simulating system also provides for simulation of blood pressure. To enable the simulation of blood pressure, the system further comprises a blood pressure sensing apparatus in the form of an inflatable cuff **21** positionable over the limb containing the brachial vessel bladder **401**. The inflatable cuff **21** is a standard inflatable blood pressure monitoring cuff, inflatable by a manual pump having a pressure gauge as commonly used for the measurement of blood pressure. The inflatable cuff **21** is provided with a pressure sensor **22** coupled to a comparator **23** mounted in the interface box **5** which compares the cuff pressure with an input blood pressure input by the operator via a blood pressure dial **24** located on the operator input terminal **4**.

Whilst the trainer is preparing to take the blood pressure by wrapping the inflatable cuff **21** over the arm above the brachial simulating vessel **401** and subsequently inflating the cuff **21**, the processor **8** will generate a signal to close the third solenoid valve **403** once the comparator **23** determines that the cuff pressure exceeds the input blood pressure **24**. This will have the effect of cutting off the flow to the brachial vessel simulating bladder **401** in much the same manner as blood flow will be cut off from a real brachial vessel when the inflatable cuff pressure exceeds the systolic blood pressure. To take the systolic blood pressure, the trainee uses a stethoscope in the usual manner to detect the commencement of pulsating flow of blood as the cuff pressure is

reduced back down to below the input blood pressure, being the point at which the processor **8** again resumes the cyclic opening and closing of the third solenoid valve **403**.

The simulator also comprises an auxiliary pulse oximetry simulating system, as depicted in FIG. 7. This pulse oximetry system is merely a simple system which provides an oxygen saturation reading on a pulse oximeter display **25** which is taken directly from a pulse oximetry input dial **26** on the operator input terminal **4**. The input oxygen saturation level is manually adjusted by the operator, and read by the trainee, as a prompt for the trainee to take suitable remedial action which can be assessed. When taking a pulse oximetry reading, the trainee will typically be required to attach a standard pulse oximetry clamp to the manikin's hand in the usual manner to add to the realism of the scenario, however the clamp itself does not in fact effect the system.

It can be seen that the systems described above provide a cost effective, robust and realistic active simulator to aid in medical training, particularly in emergency resuscitation procedures. With the use of a portable cylinder based gas source and power supply, the simulator is also particularly mobile and can be used in out-of-hospital training for emergency workers, paramedics and the armed forces, as well as more common in hospital simulation facilities.

What is claimed is:

1. A system for simulating a fluid flow condition within a fluid carrying body cavity comprising:

an elastically deformable bladder simulating said body cavity and mounted to the body of a patient simulator manikin,

a pressurized fluid supply,

an inlet tube communicating said pressurized fluid supply with said bladder,

a valve for enabling/disabling flow of fluid through said inlet tube from said pressurized fluid supply to said bladder,

a controller for controlling said valve based on said simulated fluid flow condition,

an outlet for venting fluid from said bladder,

an inlet flow restrictor for restricting flow of said fluid through said inlet tube, and

an outlet flow restrictor associated with said outlet for restricting flow of said fluid through said outlet.

2. The system of claim 1, wherein said valve comprises a solenoid valve.

3. The system of claim 1, wherein said controller comprises:

an operator input terminal for inputting said simulated flow condition and a processor for converting said input simulated flow condition into a control signal to open/close said valve.

4. The system of claim 1, wherein said bladder simulates a lung and is mounted within a chest cavity of said manikin.

5. The system of claim 4, wherein said input simulated flow condition is a respiratory rate and said control signal periodically opens and closes said valve at a cyclic rate corresponding to said input respiratory rate.

6. The system of claim 5, wherein said control signal provides a substantially constant ratio of valve opening time to valve closing time irrespective of said respiratory rate.

7. The system of claim 6, wherein said substantially constant ratio is 1:5.

8. The system of claim 4 including two said lung simulating bladders mounted side by side within said chest cavity, each said bladder having a corresponding inlet tube, valve, outlet and outlet flow restrictor associated therewith.